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Interlocking Passive Brick Set: The Design of Interlocking Building Component with Connecting Air Cavity for Heat Dissipation and Compliment to the Heating Ventilation and Air Conditioning System (HVAC)

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Abstract : This dissertation explores the design and implementation of the 'Interlocking Passive Brick Set,' a building component aimed at enhancing thermal efficiency and optimizing the performance of Heating, Ventilation, and Air Conditioning (HVAC) systems. The bricks specially demonstrate a thermal resistance of and a low thermal transmittance, reflecting their ability to manage heat flow and heat dissipation effectively. The research focuses on the interaction between the exterior and interior surfaces of the brick set, where the exterior is exposed to a hot environment, and the interior remains cooler. The design incorporates a central air cavity with lower thermal transmittance than solid surfaces. This cavity facilitates a heat dissipation cycle: hotter air rises and is expelled through the top compartment, while cooler air descends, cooling the space. This convective process enhances the overall thermal regulation within the structure. The data explain the discrepancy between prediction and measurement in the thermal performance of interlocking brick systems and how the integrated air cavity overcomes these issues. Heat-flux measurements were correlated in a general form to enable designers to account for convection at both the interior and exterior surfaces.

Keywords : building envelope, thermal efficient design, energy efficient design, thermal comfort
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